

# ADAPT TO A HOTTER LA: Water Conservation at City Level

by Xinyue Li | Environmental Science and Engineering, Institute of Environment and Sustainability  
Lewis Center Award Winner for Innovative use of Spatial Analysis and GIS in Policy Analysis

Water scarcity is an ongoing reality in California. The statewide water content of snowpack on April 1, 2015, when the snowpack is normally at its peak, was only **5%** of the historical average. As of April 30th, 2015, the monthly statewide reservoirs were **61%** of average levels. The decreased surface water availability led to an increased use of groundwater, and makes communities highly vulnerable to groundwater contamination due to a lack of alternative water sources. Moreover, the groundwater has been pumped at an unsustainable rate. NASA reveals that, since 2011, the Sacramento and San Joaquin river basins decreased in volume by **4 trillion gallons of water** each year, two-thirds of which is due to depletion of groundwater beneath California's Central Valley. It is estimated that it will take about **11 trillion gallons of water -- 1.5 times** the maximum volume of Lake Mead, the largest U.S. reservoir -- to recover from the continuing drought.

In response to the mega-drought, Governor Jerry Brown declared Drought State of Emergency on January 17, 2014, urging residents to reduce water use by **20%**. In the following July, the State Water Board adopted an Emergency Water Conservation Regulation, requiring mandatory reporting of water usage by urban water suppliers. As we enter the fourth year of drought, the Metropolitan Water District of Southern California passed new acts to continue delivering water-saving messages, including awarding an advertising firm a \$5.1 million contract to promote region-wide water conservation in 2015.

## RESEARCH QUESTIONS

- 1 How do cities perform in water conservation?
- 2 Which cities could provide best practices and which could offer valuable lessons?
- 3 Where should the water conservation campaign be to be more cost effective?

## FINDINGS

- 1 Water uses vary greatly across cities. The highest total GPCD is about 900 times higher than the lowest. The highest R-GPCD is more than 3 times higher than the lowest.
- 2 Most of the cities reduced water use. 31 cities reduced residential water use by 20% and thus reached the water conservation goal. 3 cities increased water use instead.
- 3 The spatial prediction result indicates that the residential water use is higher in the northwest LA than the southeast LA.

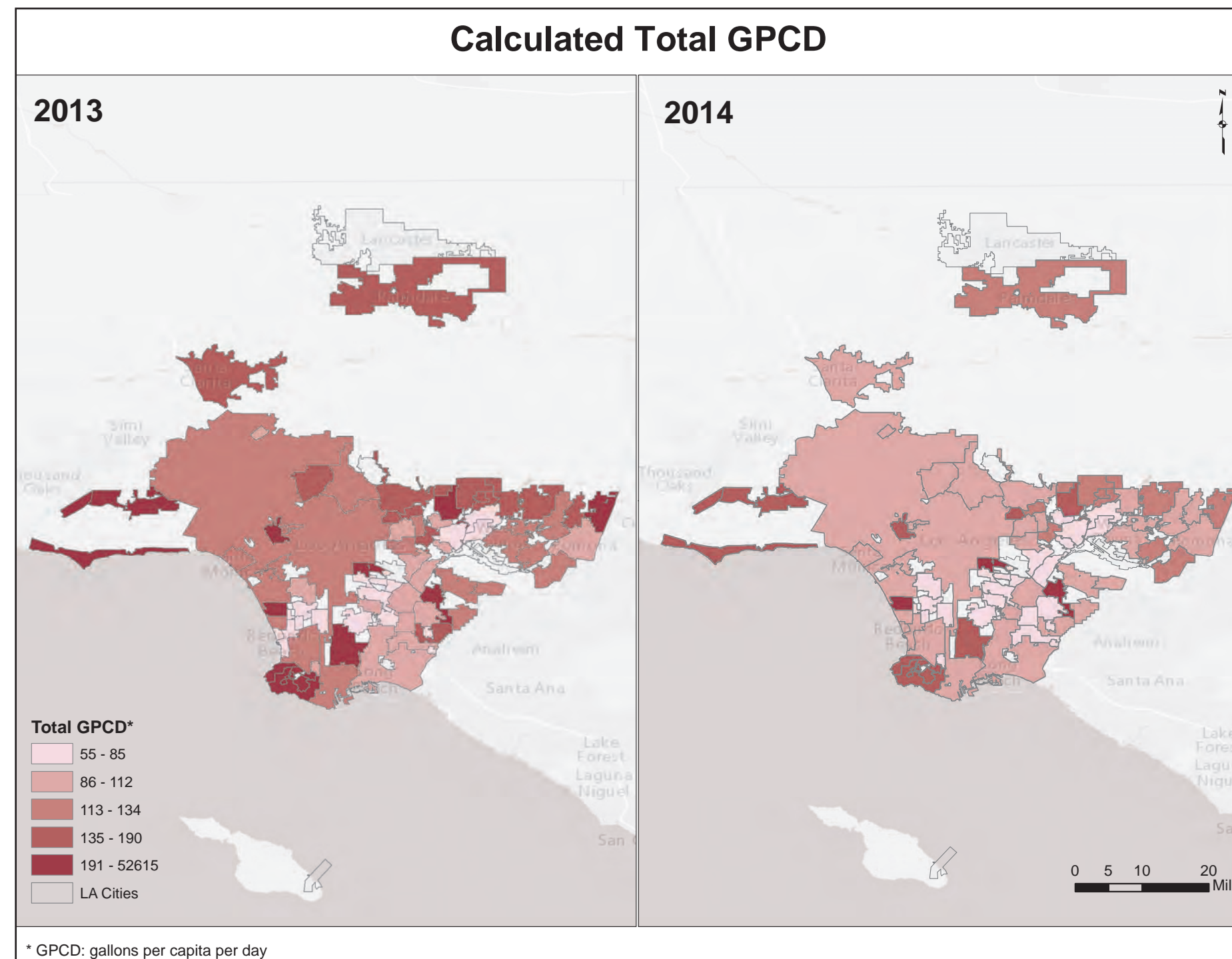
## METHODOLOGY

- Identify the major water utility in each city and use the utility's reporting information as a proxy for the city's water consumption.
- Compare cities' water consumption in 2014 with that in 2013 and calculate water use reduction rate to find which cities are in the lead and which fall behind.
- Use kriging to predict water consumption level at smaller scale to find target areas for outreach campaigns.

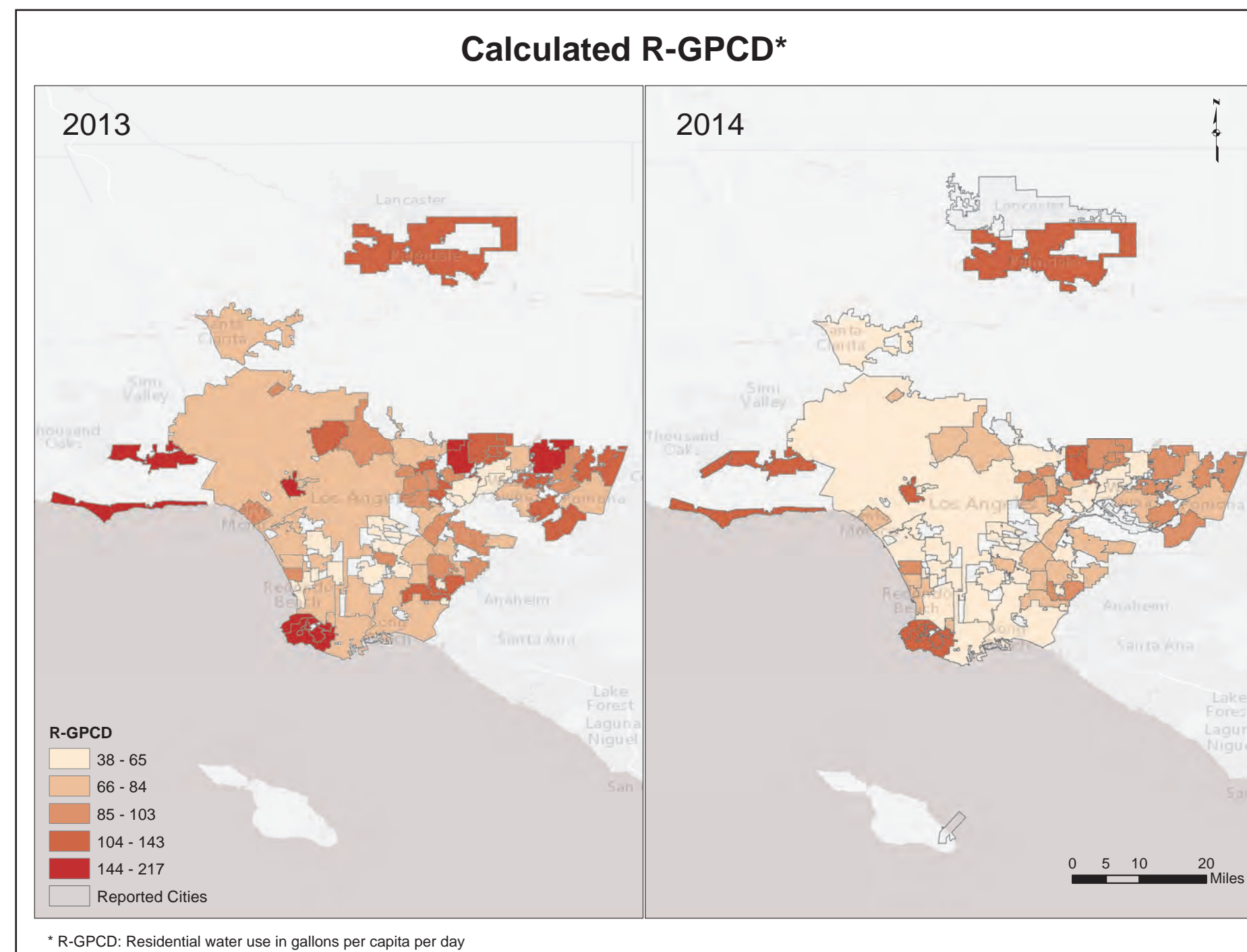
## RECOMMENDATIONS

- Establish case studies of Westlake Village and Santa Clarita, the two cities reduced residential water use by over 40%, to look for best practices in water conservation.
- Establish case studies of El Segundo, Hermosa Beach, Redondo Beach and Paramount, who increased residential water use in 2014, to draw lessons from them.
- Use the spatial water use prediction as a reference to plan outreach campaign in areas that are at the highest residential water use level and have the greatest potential to reduce a substantial amount of water use.

City	Vernon	El Segundo	Santa Fe Springs	Beverly Hills	Malibu	Carson	Westlake Village	Agoura Hills	Calabasas	Arcadia
Total GPCD	48436	489	215	176	162	161	159	140	140	116



City	Beverly Hills	Agoura Hills	Hidden Hills	Calabasas	Malibu	Arcadia	Palos Verdes Estates	Rancho Palos Verdes	Rolling Hills Estates	Rolling Hills
Total GPCD	48436	489	215	176	162	161	159	140	140	116



**REFERENCES:**

Background:

- Snow Water Equivalents: <http://dec.water.ca.gov>
- Summary of Storage in Major Reservoirs: <http://dec.water.ca.gov>
- State Study Finds Numerous Communities Rely On Contaminated Groundwater Sources for their Drinking Water Supply: <http://www.waterboards.ca.gov>
- NASA Analysis: 11 Trillion Gallons to Replenish California Drought Losses: <http://www.nasa.gov>
- Governor Brown Declares Drought State of Emergency, 2014: <http://ca.gov/Drought>
- Urban Water Suppliers Report Progress on Conservation Measures, 2014: <http://www.waterboards.ca.gov>
- Metropolitan Board Acts to Continue Delivering Water-Saving Message in Fourth Drought Year: <http://www.mwd20.com>

Methodology:

- Instructions for Estimating Residential Gallons Per Capita Day (R-GPCD) in Completing Monthly Urban Water Supplier Report: <http://www.waterboards.ca.gov>

Data Sources:

- Water Conservation Reporting Data, City and Water Districts: <http://www.waterboards.ca.gov>
- Cities' Water Suppliers: <http://www.waterboards.ca.gov>
- California Cities (2012) Shapefile: <http://www.wdsd.ca.gov>
- California Water Purveyor Service Areas (2011) Shapefile: <http://egs3.lacounty.gov>
- California-American Water Company Los Angeles district: <http://www.amwater.com>
- Online Geocoder: <http://geocoding.geo.census.gov>
- Water and Electricity Use by Zip Code: <https://data.lacity.org>
- Household Income: <http://factfinder.census.gov>
- 2010 ZCTA to Census Tract Relationship: <https://www.census.gov>

